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air



# air



LADYBIRD LEADERS



## to teachers and parents

This is a LADYBIRD LEADER book, one of a series specially produced to meet the very real need for carefully planned *first information books* that instantly attract enquiring minds and stimulate reluctant readers.

The subject matter and vocabulary have been selected with expert assistance, and the brief and simple text is printed in large, clear type.

Children's questions are anticipated and facts presented in a logical sequence. Where possible, the books show what happened in the past and what is relevant today.

Special artwork has been commissioned to set a standard rarely seen in books for this reading age and at this price.

Full-colour illustrations are on all 48 pages to give maximum impact and provide the extra enrichment that is the aim of all Ladybird Leaders.

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# A Ladybird Leader **air**

written by Allan P. Sanday

illustrated by Gerald Witcomb and Harry Wingfield



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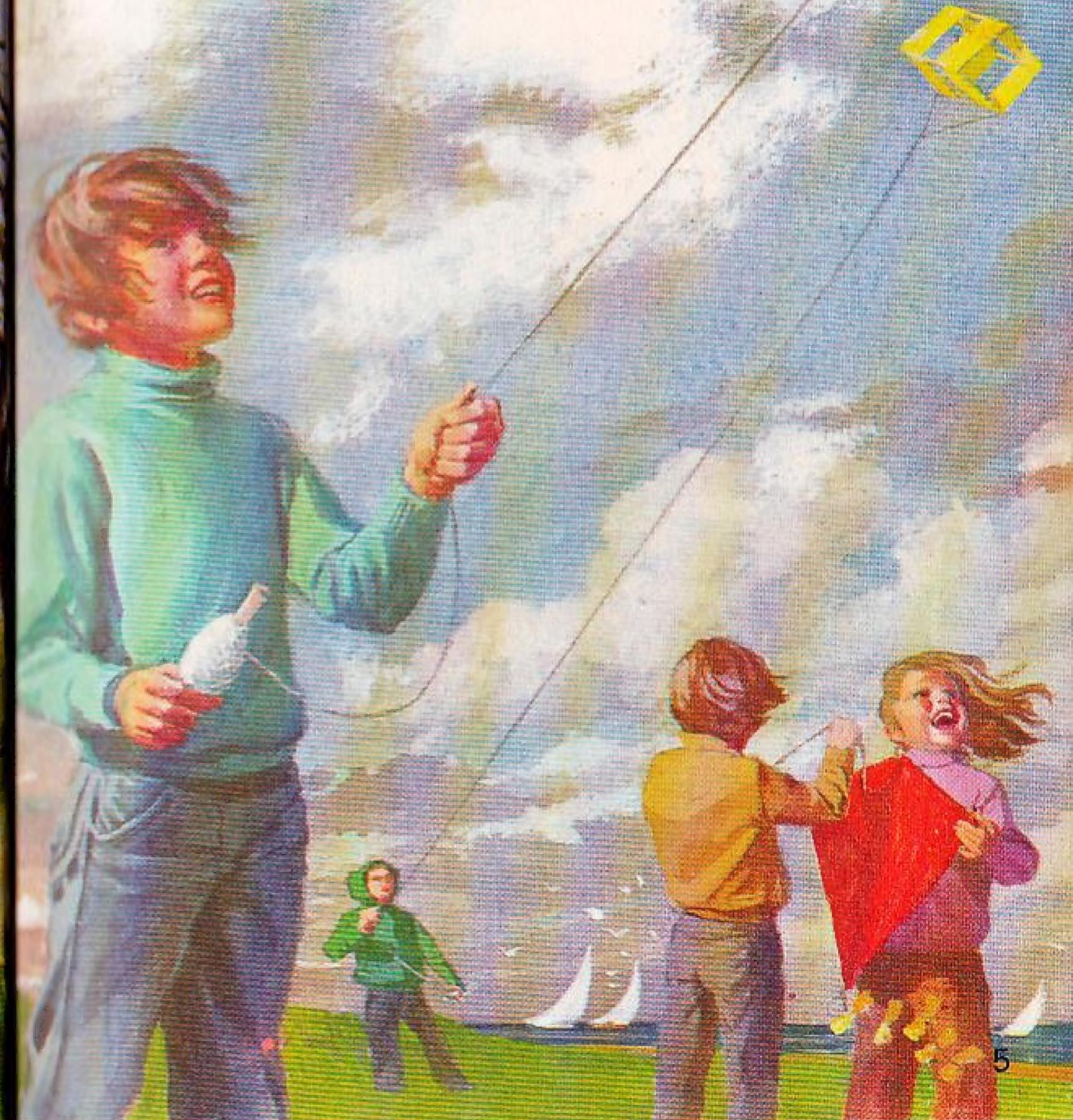
**Air is all around us**

We cannot see air, or smell it,  
or taste it, but we can tell  
that it is there when the wind blows.



**When the wind blows  
the air is moving.**

See how the wind blows the kite,  
the sailing boats  
and the children's hair.



## Moving air

We make the air move  
when we cool ourselves with a fan.

With an electric fan  
we make the air move faster still.



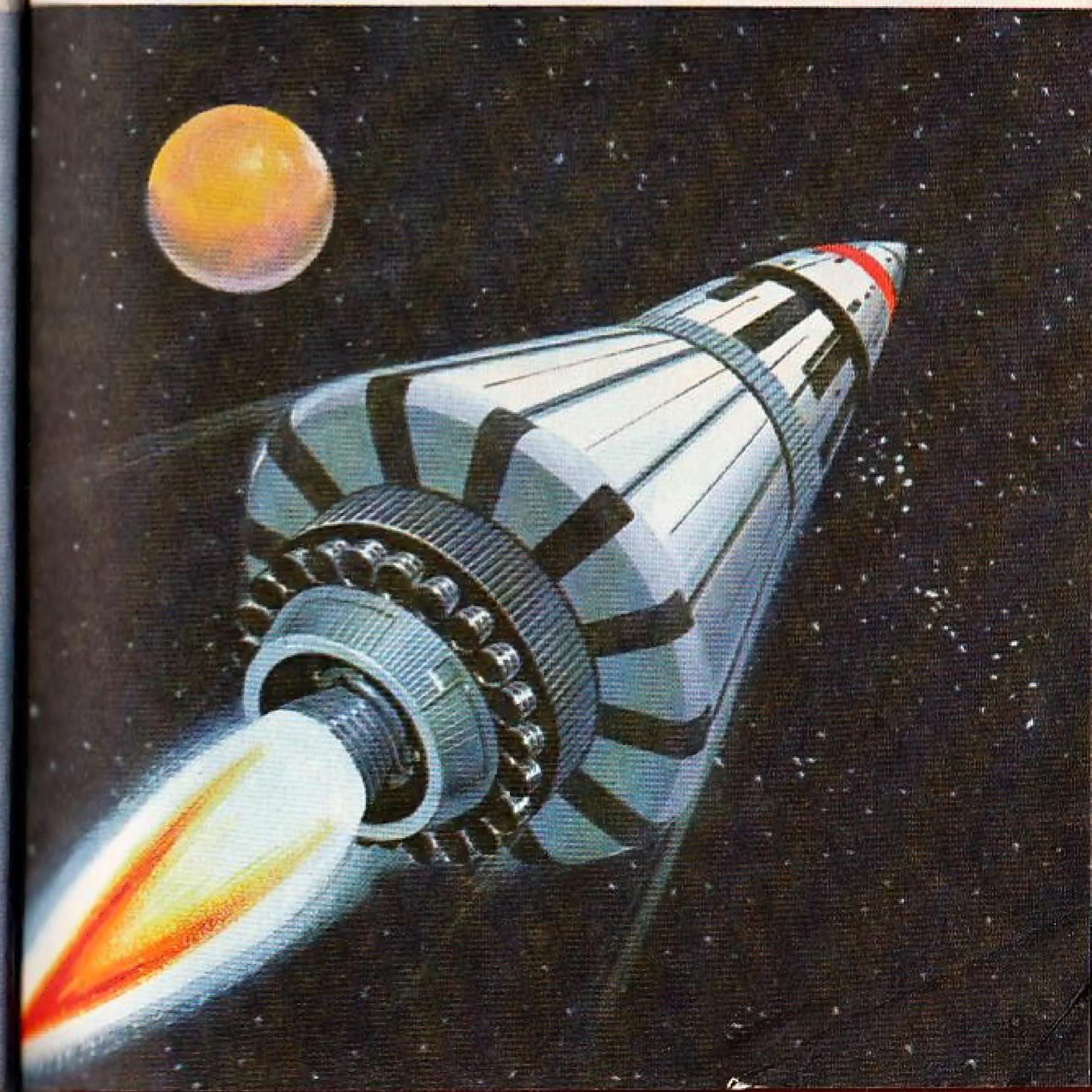
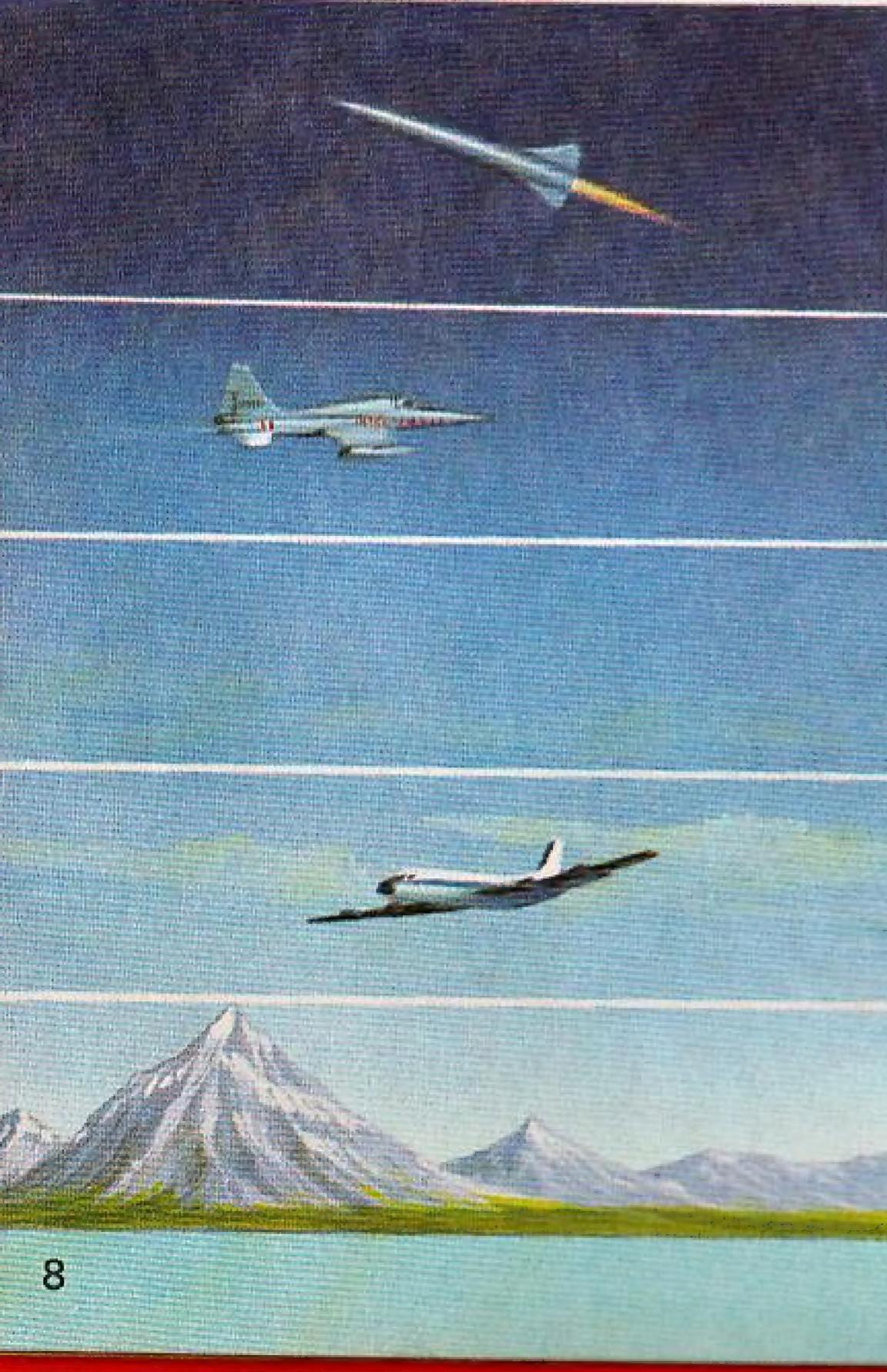
When there is a hurricane  
the air is moving very fast.  
These houses have been wrecked  
by a hurricane.



## The air above us

Close to the earth's surface  
there is plenty of air.

As we climb higher  
there is less and less air.



At the top of a high mountain  
there is very little air.

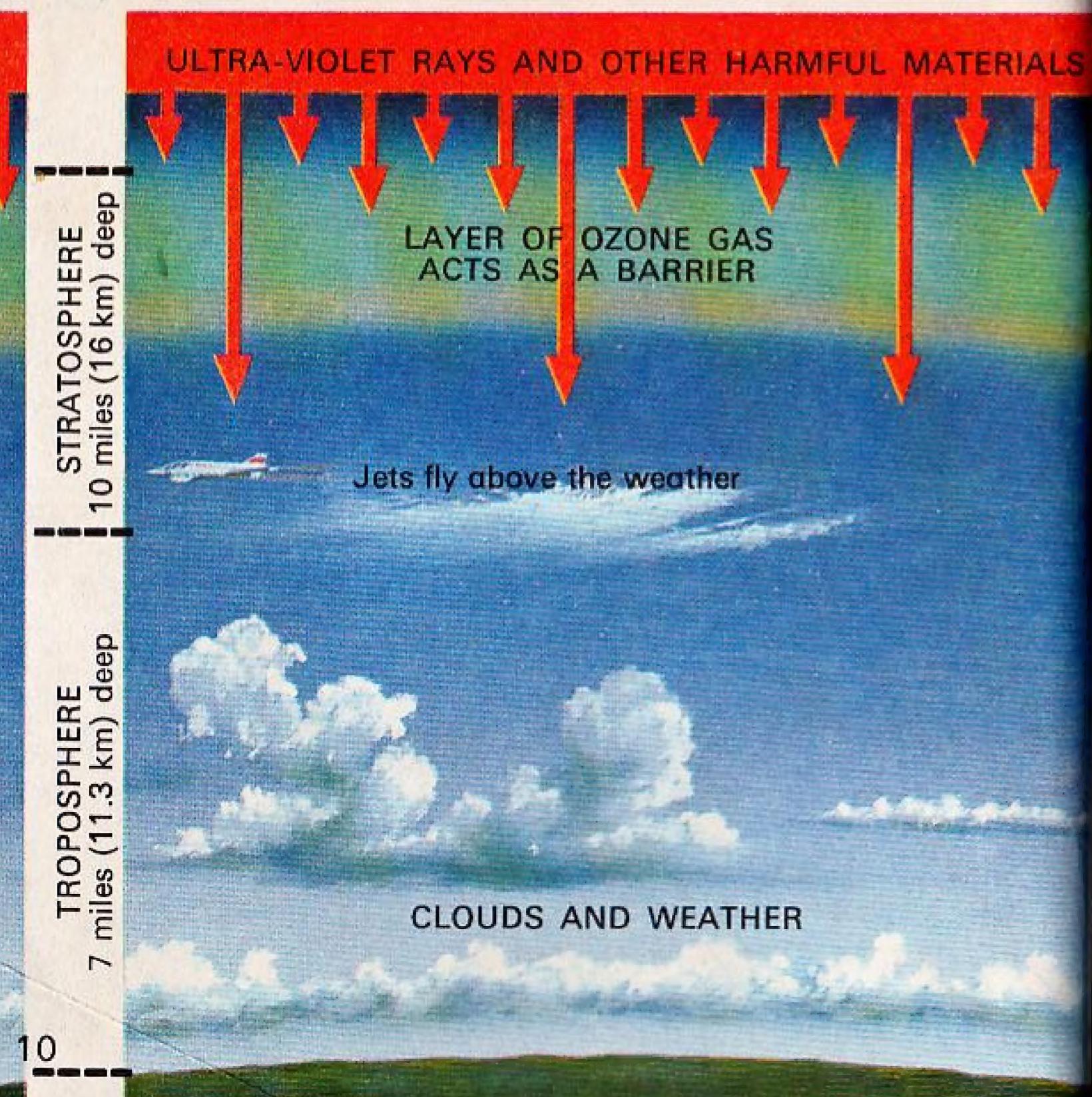
Out in space there is no air at all.

## An envelope of air

The earth is surrounded by layers of air.

Some keep the temperature of the earth constant.

Others keep out harmful rays from the sun.



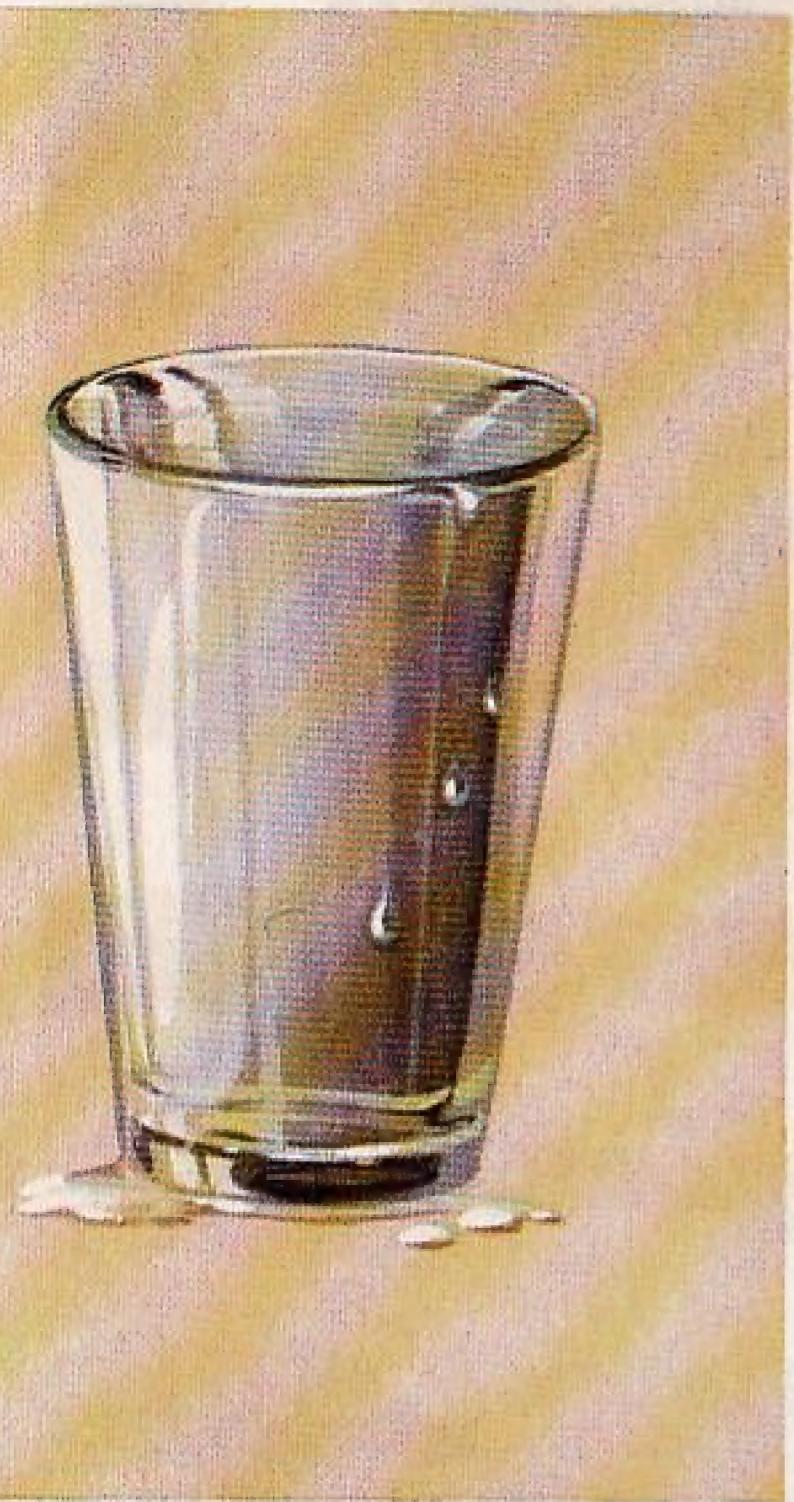
## A planet without air



Some planets, like the moon, have no atmosphere.

Man must take his own air, or oxygen, with him.

## Air presses all around us



Fill a glass brim full of water.  
Slide a card over the top.  
Hold the card in place  
while you turn the glass upside down.  
Take your hand away  
from under the card.

The water does not fall  
out of the glass.  
It is held in place  
by the pressure of the air.

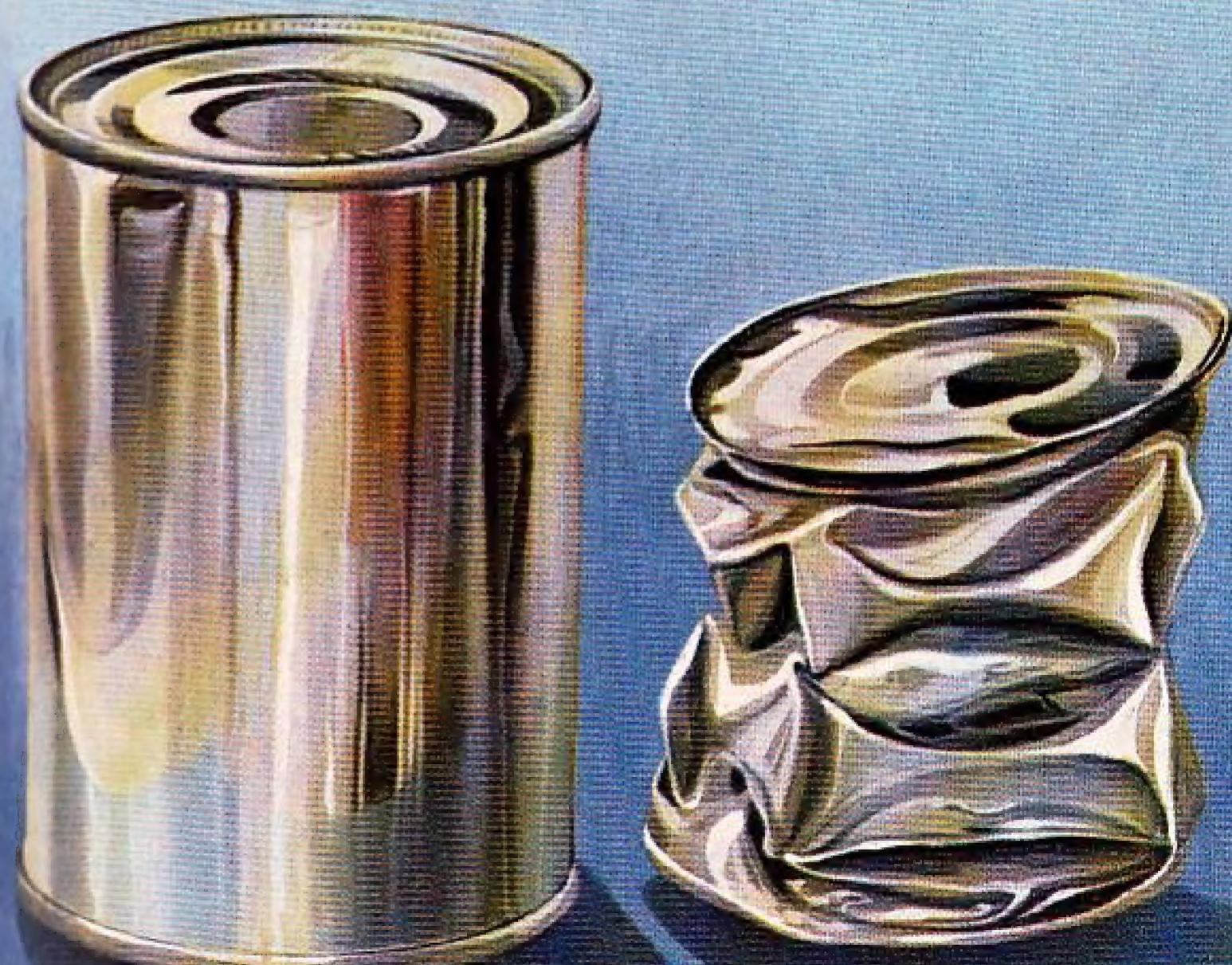
*To avoid accidents  
do this experiment over a sink or bowl.*

## Air pressure

We cannot usually feel the pressure of the air because it presses on the inside as well as on the outside of hollow objects.



If we pump the air out of this sealed metal can, the pressure of the air on the outside makes it collapse.



## Air pressure



Our bicycle is held up  
by the pressure of air in the tyre.  
The tyre is like a thin bag of air.



The car is heavier than the bicycle,  
so we must have a greater pressure  
of air in the tyre.

## A cushion of air

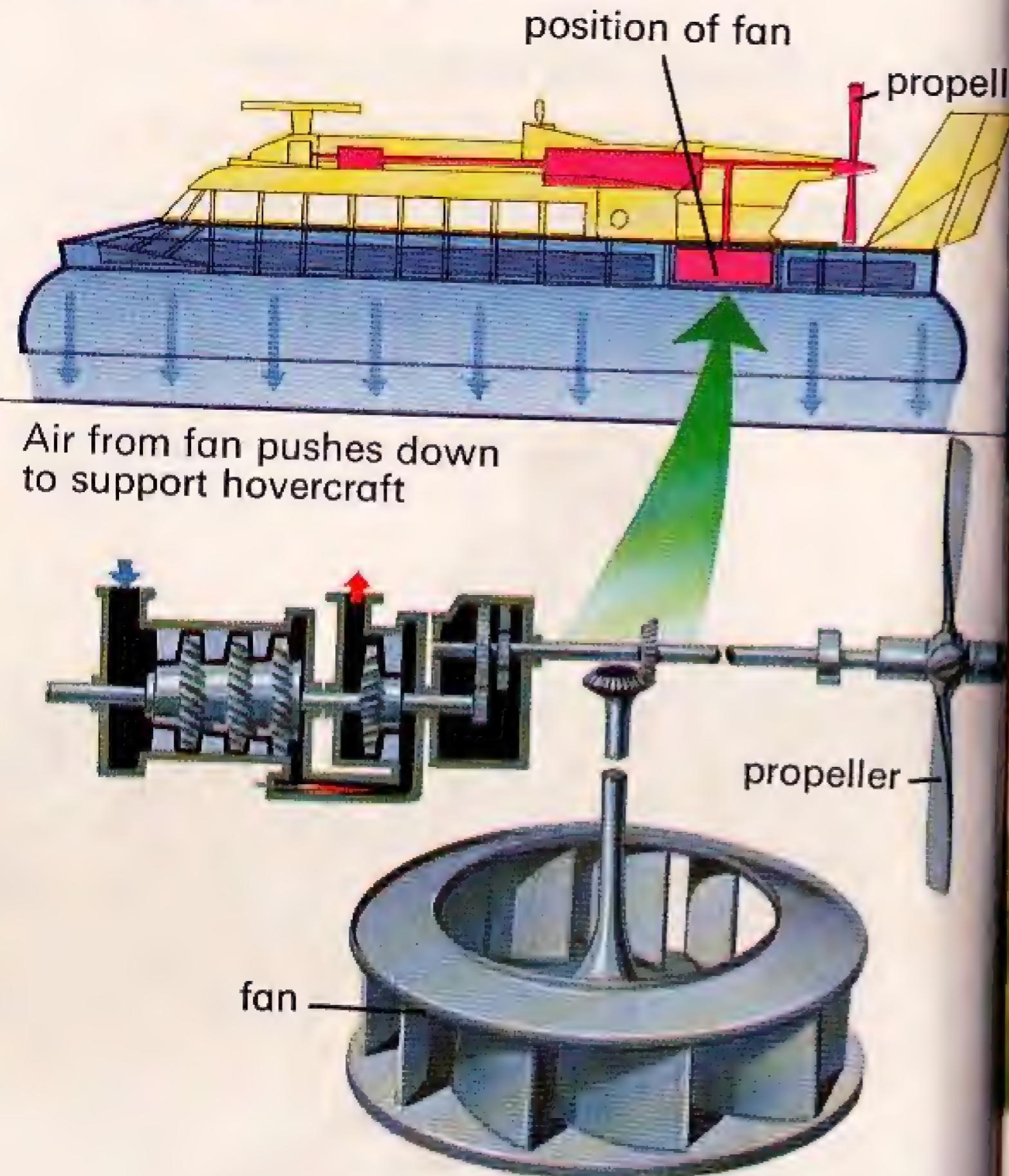
If we have a solid rubber tyre  
we feel every bump.  
There is no cushion of air  
to make the ride more comfortable.



Our inflated tyre moulds itself  
round the bumps  
so that we have a smooth ride.



## Supporting air



The hovercraft is kept up by air blown from the big fan.



The hovercraft can move smoothly over water and over rough ground.

## Another cushion of air

This train is guided and supported by wheels which run on the rails. It cannot travel **very** fast, and the wheels wear out in time.



This monorail train floats on a cushion of air between the train and the rail. It can move **very** fast, and there are no wheels to wear out.





## Air used to propel

This jet aeroplane is moved along by the jet of hot air blown out from the engines.



This 'Harrier' jump-jet is using its jet of hot air to move it straight up in the air. It can land and take off in a very small space.

## Air that supports



Take two similar sheets of paper.  
Screw one into a ball.  
Drop both pieces at the same time.  
The flat sheet falls slowly  
because it is slowed down by the air.

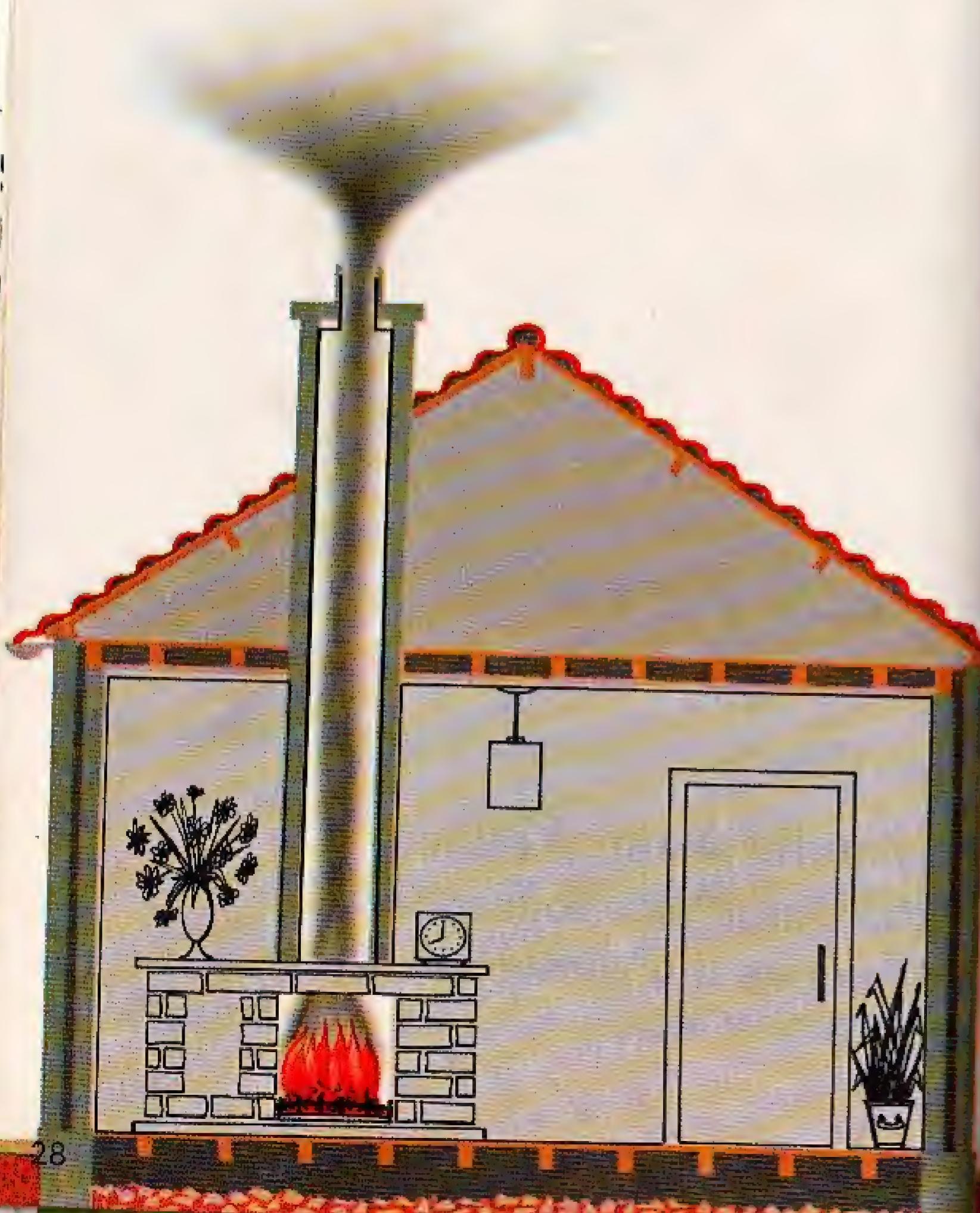


Like the sheet of paper,  
the parachute falls slowly  
because it is slowed down by the air.

## Hot air rises

The fire makes the air hot.

The hot air rises up the chimney, taking the smoke with it.



When the sun shines on the land, the land gets hot.

The air above the land gets hot and rises.

The wind blows in from the sea to replace the air that has risen.



## Hot air rises

Rising currents of hot air are called 'thermals'.

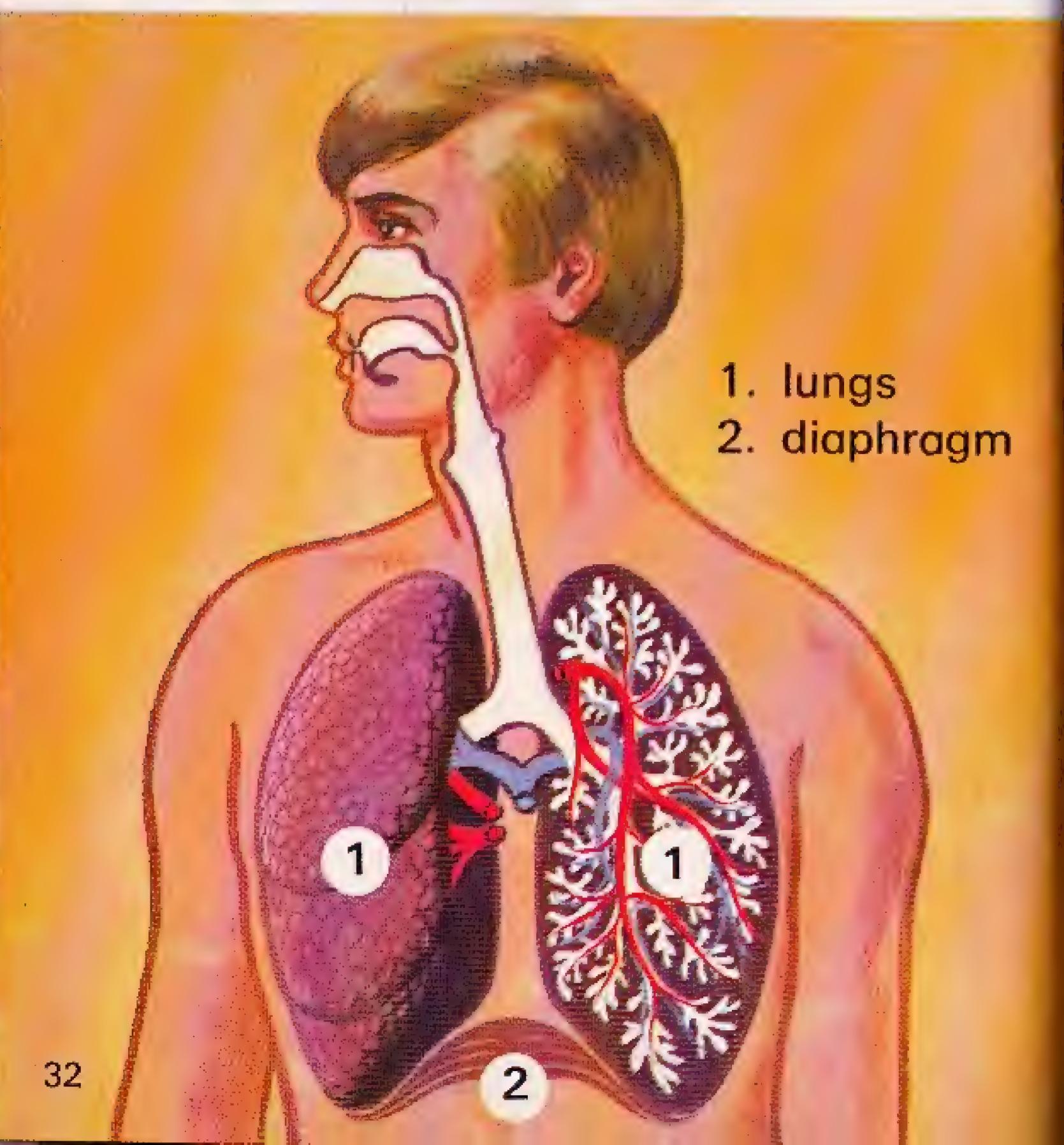
Birds and gliders rise in the air on these thermals.



The hot air in this balloon causes it to rise. The air inside the balloon is lighter than the air outside because it has expanded.

## How we breathe

Your lungs work like bellows. Your ribs and a muscle called the diaphragm (pronounced '*diafram*') help the lungs to suck in air and blow it out again.



Normally you breathe about sixteen times every minute. When you are running, you need more air. You breathe faster and the 'bellows' work harder.



## When there is no air

In a fire, the air is full of smoke.

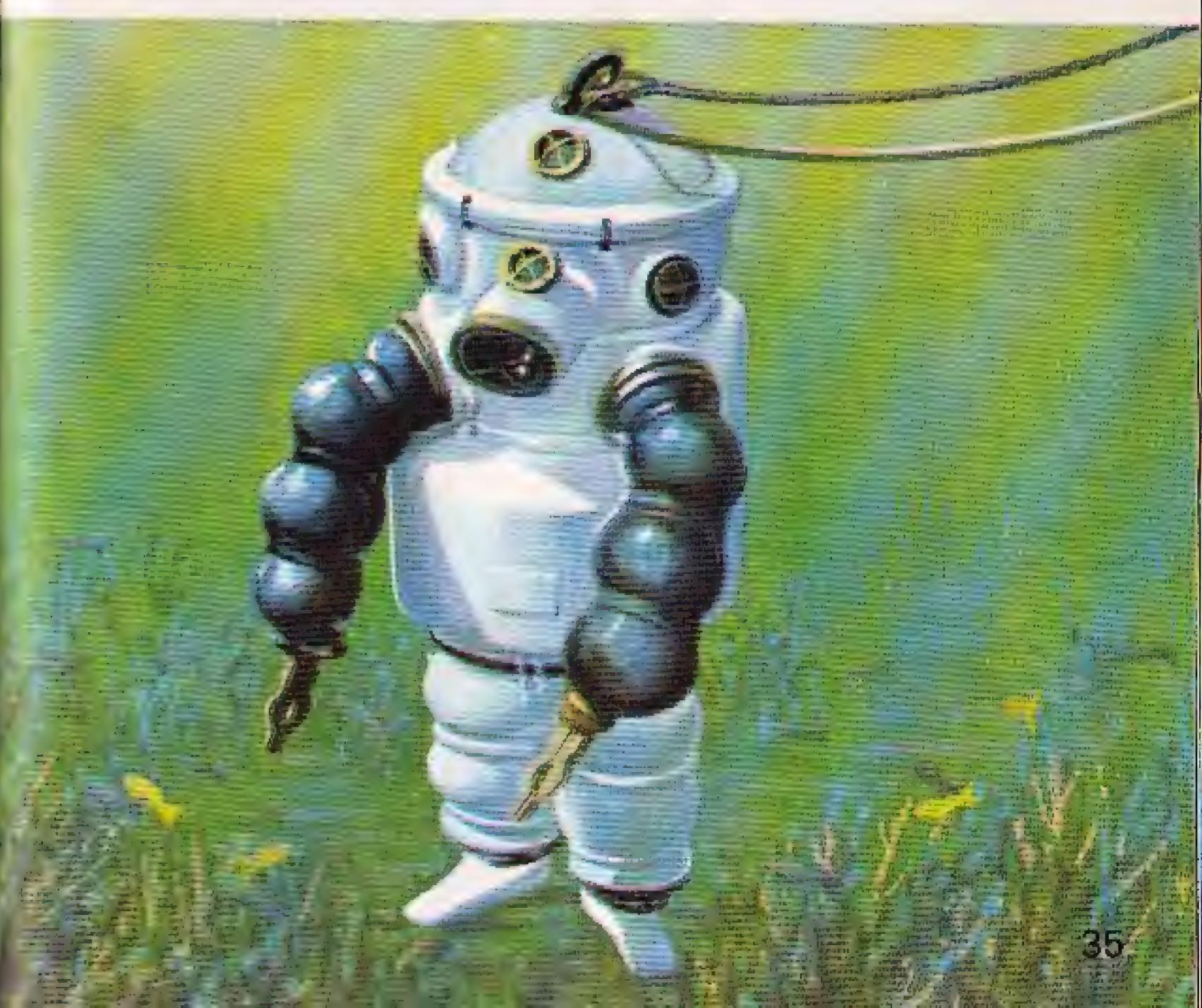
These firemen must wear breathing apparatus.

This gives them clean air or oxygen to breathe.



## Divers must have air or oxygen

It is pumped down to them through pipes, or they get it from cylinders on their backs.



## Where there is little air

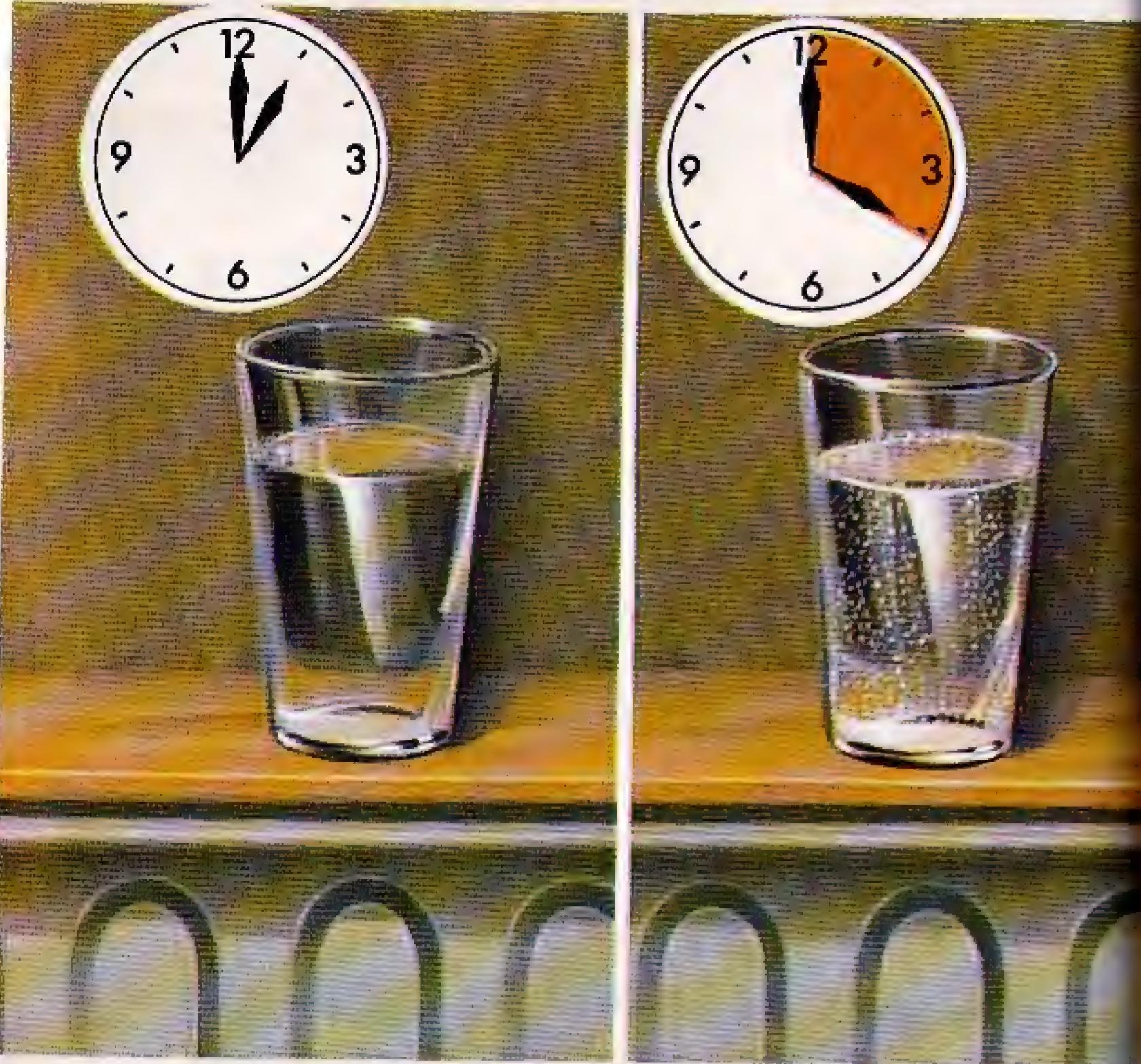
At the top of a high mountain  
there is very little air.

The mountaineer must get oxygen  
from the cylinders on his back.



This high-flying aeroplane  
must be kept closed up  
so that the air  
does not escape from the cabin.

## Air in water



Put a glass of tap water in a warm place.

Several hours later there are tiny bubbles of air in the glass. This air was dissolved in the water.



Fish use this air when they take in water through their gills.

When the sun shines  
on the leaves of green plants,  
they take in a gas, carbon dioxide  
and give out oxygen gas.

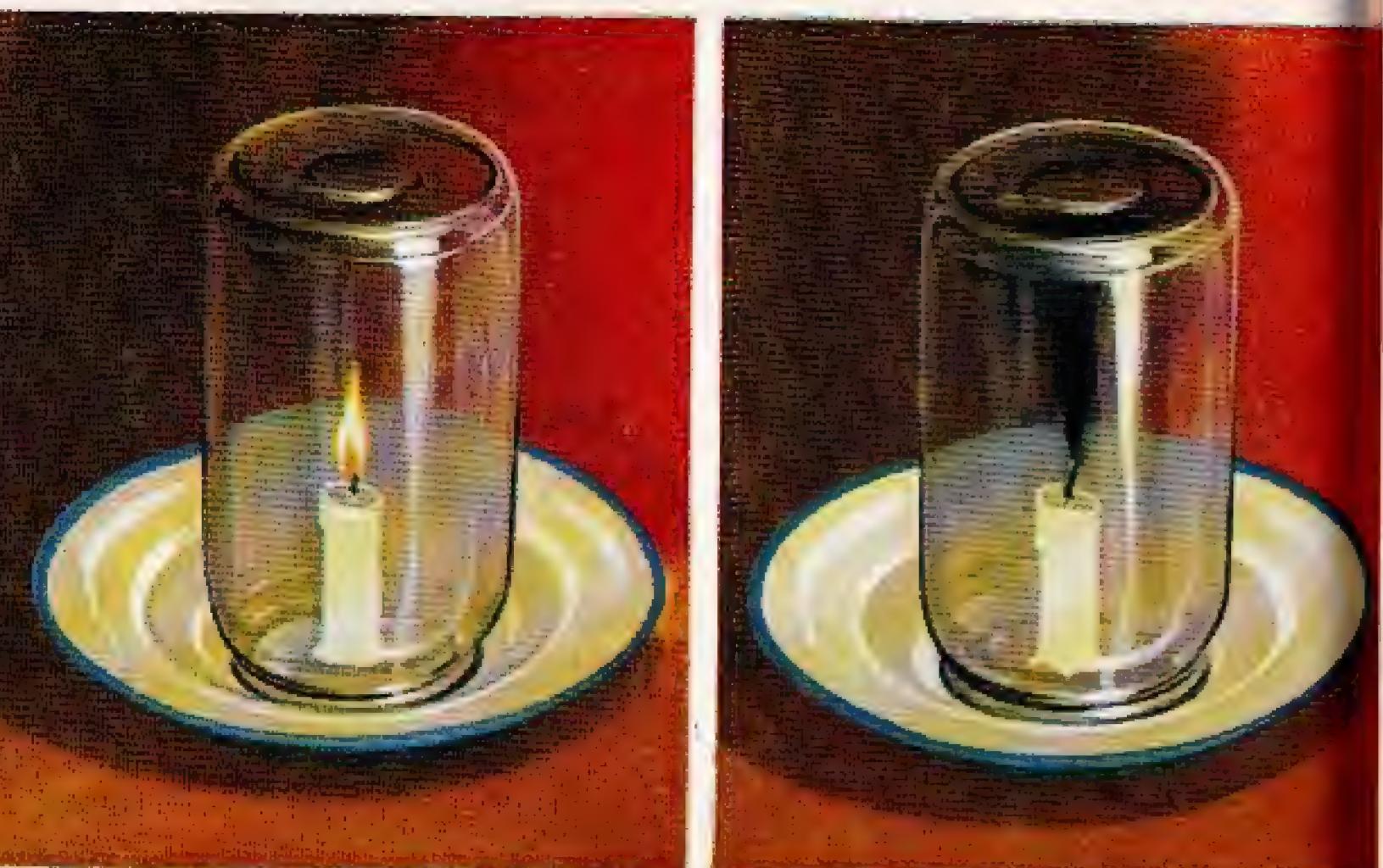


## Gases in the air

The people are using up oxygen  
and giving out carbon dioxide.  
The plants are using up carbon dioxide  
and giving out oxygen.



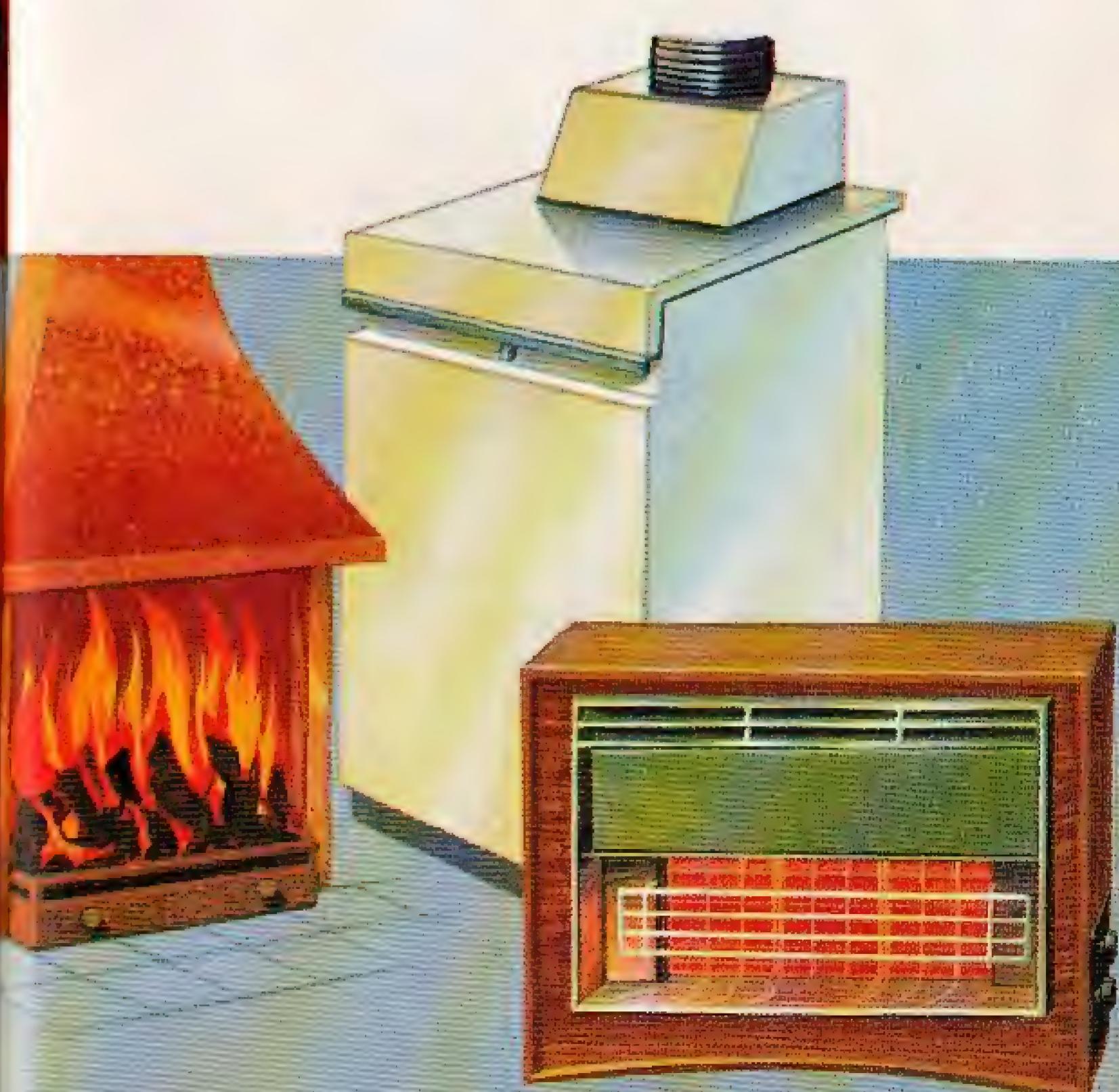
## Burning uses oxygen



When things burn,  
they use up oxygen from the air.

If a candle is left burning  
under a jam-jar,  
it soon goes out because it has  
used up all the oxygen.

When coal, coke, gas or oil burn,  
they all use up oxygen.  
They all produce carbon dioxide.



## Smoke and 'smog'

When coal burns, it produces smoke. This smoke is made up of tiny pieces of carbon (soot) and poisonous gases.



Smoke causes 'smog'.

'Smog' is a mixture of smoke and fog. In the past, people have died because they have had difficulty in breathing in 'smog'.



## 'Smokeless fuel'



In the past, homes and factories used to burn coal.

Many now use 'smokeless fuel', coke, gas or oil instead of coal.

These fuels do not make smoke.

In recent years there has been no 'smog' due to smoke.

## Clean air in a modern city

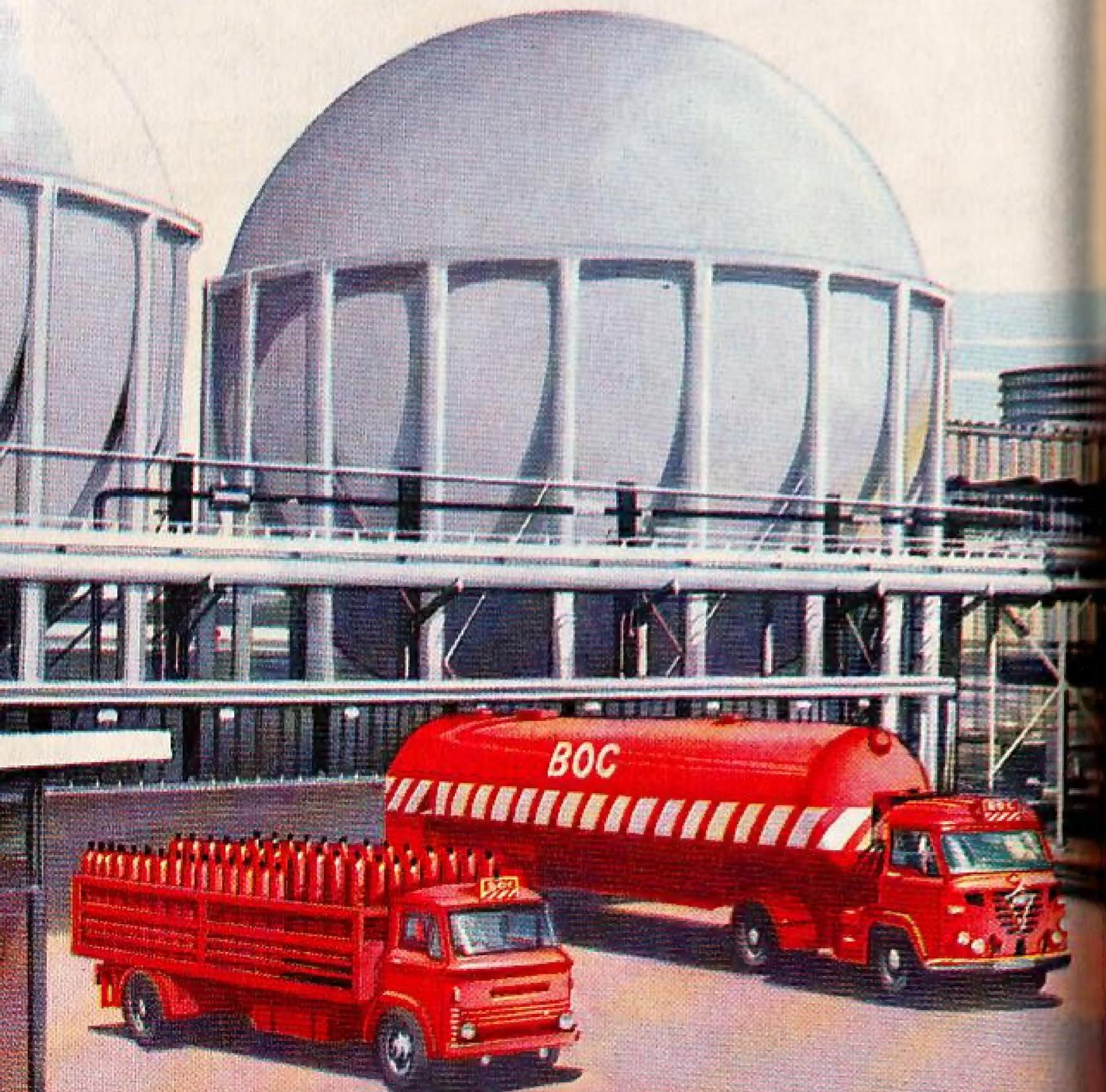


## The use of oxygen

Oxygen can be separated out from the air.

It is stored in strong cylinders.

It can also be stored as a liquid at a **very** low temperature.



When the gas **acetylene** burns with pure oxygen, it produces a very hot flame which is used for welding.



## Putting out the fire

When things burn  
they use up oxygen from the air.  
We can sometimes put out the fire  
by covering it with a wet towel.



## Stop the fire spreading

### BURNING CLOTHING

- lay person down
- wrap in rug or blanket

DO NOT  
TAKE PERSON  
OUTDOORS!



If we stop the air  
getting at the burning material,  
the fire will go out.



KEEP DOORS  
CLOSED AT NIGHT  
closed doors  
prevent fire and smoke  
from spreading

## An interesting experiment

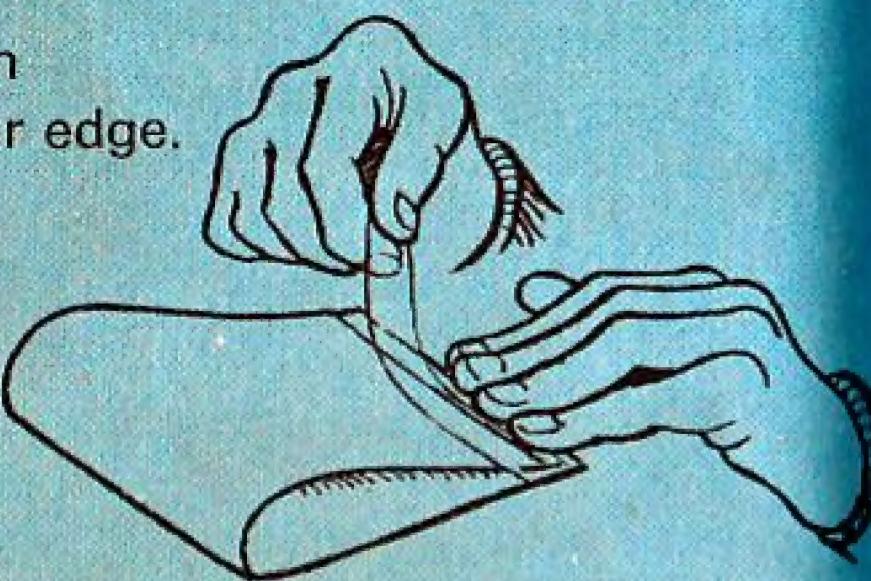
to show how air lifts an aeroplane wing

1. Cut out a piece of paper  $20\text{ cm} \times 10\text{ cm}$ .

Bend it in half.

'Sellotape' one edge down  
about 1 cm from the other edge.

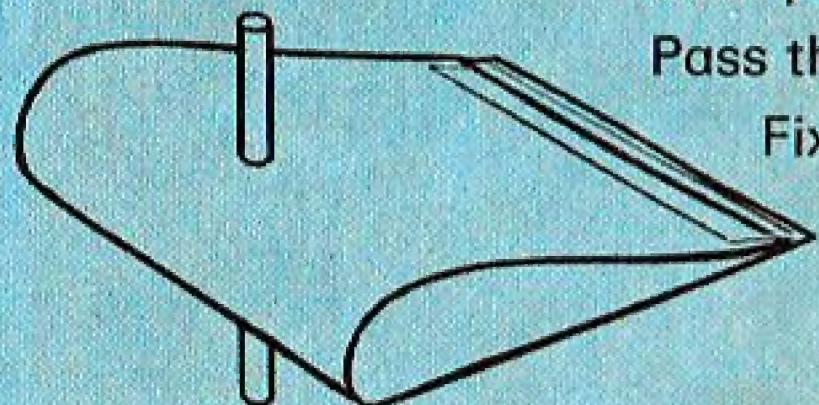
This will make a curved  
top-side and  
a straight bottom-side.



2. Make a hole for a drinking straw,  
about 3 cm from the fold, through  
both pieces of paper.

Pass the straw through the holes.

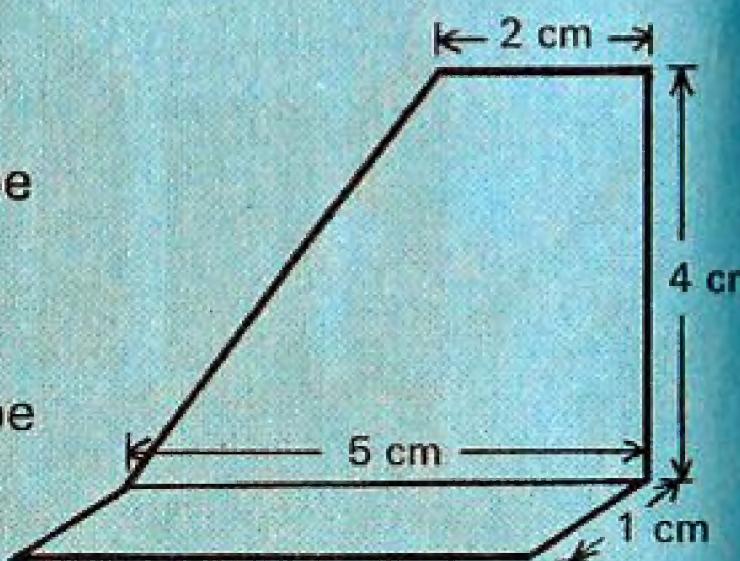
Fix it with glue.



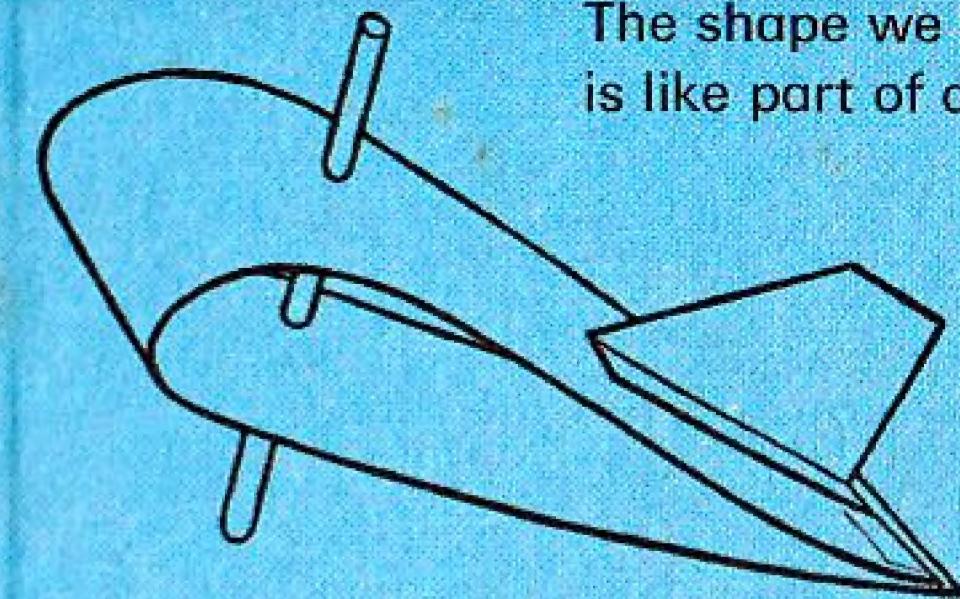
3. Cut a tailpiece to the shape  
shown.

Fold to make a glue tab.

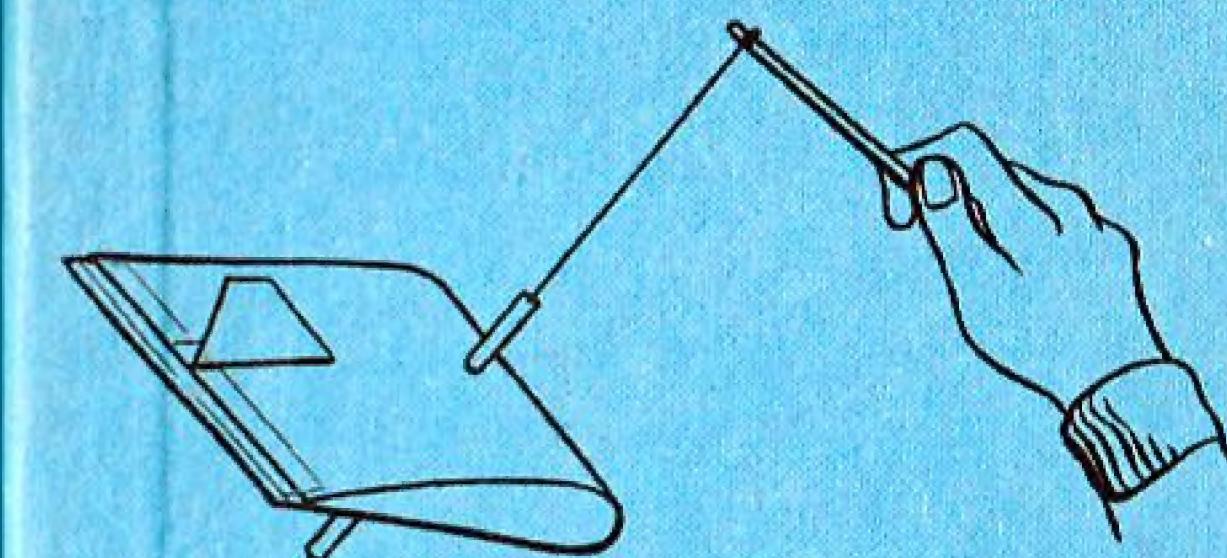
Glue it onto the wing shape  
to stand upright.



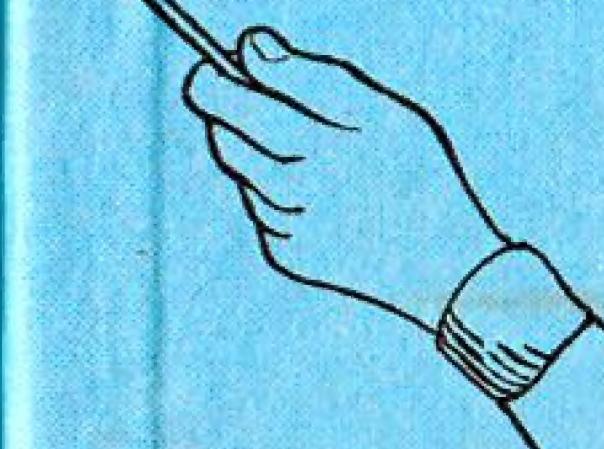
The shape we have made  
is like part of an aeroplane wing.



This shape when it moves through the air, gives 'lift'  
to the wing. You can prove this.



4. Thread some smooth, thin string  
through the straw.  
Fix each end to a stick.



5. Hold the two sticks  
with the string tight.  
The wing should rest on  
the bottom stick.  
Swing round with the sticks  
outstretched.

The wing will rise up the string.